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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/668,321

09/24/2003

Atsushi Hirota

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02/24/2005

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EXAMINER

MRUK, GEOFFREY S

ART UNIT

PAPER NUMBER

2853

DATE MAILED: 02/24/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/668,321

Applicant(s)

HIROTA ET AL.

Examiner

Geoffrey Mruk

Art Unit

2853

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 September 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11 February 2004.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the mirror symmetry of the piezoelectric unit (Figure 6, element 20; Figure 9, element 200), in a lamination direction, must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claims 1 and 11 are objected to because of the following informalities:

The specification does not support the mirror symmetry of the piezoelectric unit in a lamination direction, as claimed.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-7 and 11-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Takahashi et al. (US 5,266,964).

With respect to claim 1, Takahashi discloses an inkjet head (Figure 6, element 15), comprising:

- a cavity unit (Figure 7) having a plurality of ink pressure chambers (Figure 7, elements 132a-132c) formed at a regular interval; and
- a piezoelectric unit (Figure 7, element 138) stacked on said cavity unit to close the openings of said ink pressure chambers, said piezoelectric unit including a laminate of a plurality of piezoelectric layers (Column 5, lines

55-57) and a plurality of common electrodes (Figure 7, elements 142a-142c, 152), and

- a plurality of driving electrodes (Figure 7, elements 154a-154c) formed on a top face thereof at positions corresponding to respective ones of said pressure chambers,
- wherein said piezoelectric layers and said common electrodes are arranged such that upper and lower halves of said piezoelectric unit in a lamination direction thereof are mirror symmetric to each other (Column 3, lines 33-51; Column 5, lines 51-54).

With respect to claim 2, Takahashi discloses a laminate that comprises a plurality of subunits, each subunit including a pair of said piezoelectric layers and one of said common electrodes interposed there between (Column 3, lines 33-51).

With respect to claim 3, Takahashi discloses a piezoelectric unit (Figure 7, element 138) includes even numbers of said piezoelectric layers and odd numbers of said common electrodes, and wherein said piezoelectric layers and said common electrodes are laminated alternately with each other (Column 3, lines 33-51).

With respect to claim 4, Takahashi discloses a piezoelectric unit (Figure 7, element 138) includes a pair of said common electrodes (Figure 7, elements 142a-142c, 152) interposed between said piezoelectric layers such that distances from a center of said piezoelectric unit to respective ones of said pair of common electrodes in the lamination direction are substantially the same (Column 3, lines 33-51).

With respect to claim 5, Takahashi discloses each of said common electrodes extends substantially over the whole area defined between said piezoelectric layers sandwiching said common electrode (Figure 3, elements 42a-42d; Column 3, lines 52-62).

With respect to claim 6, Takahashi discloses each of said common electrodes has an exposed portion, said exposed portion being exposed on a side surface of said piezoelectric unit (Column 4, lines 15-21).

With respect to claim 7, Takahashi, discloses each of said common electrodes is grounded through said exposed portion (Figure 7, electric circuit diagram).

With respect to claim 11, Takahashi discloses a piezoelectric actuator (Figure 7) for an inkjet head (Figure 6, element 15), comprising:

- a multilayer sheet (Figure 7, element 140) including a plurality of piezoelectric layers (Figure 7, element 138) and a plurality of common electrodes (Figure 7, elements 142a-142c, 152); and
- a plurality of driving electrodes (Figure 7, elements 154a-154c) formed on an outer surface of said multilayer sheet,
- wherein said piezoelectric layers and said common electrodes are arranged such that upper and lower halves of said multilayer sheet in a lamination direction thereof are substantially mirror symmetric to each other (Column 3, lines 33-51; Column 5, lines 51-54).

With respect to claim 12, Takahashi discloses a multilayer sheet (Figure 7, element 140) includes a plurality of sheet subunits, each sheet subunit including a pair

of said piezoelectric layers and one of said common electrodes interposed there between (Column 3, lines 33-51).

With respect to claim 13, Takahashi discloses a multilayer sheet (Figure 7, element 140) includes even numbers of said piezoelectric layers and odd numbers of said common electrodes, and wherein said piezoelectric layers and said common electrodes are laminated alternately with each other (Column 3, lines 33-51).

With respect to claim 14, Takahashi discloses a multilayer sheet (Figure 7, element 140) includes a pair of said common electrodes (Figure 7, elements 142a-142c, 152) interposed between said piezoelectric layers such that distances from a center of said multilayer sheet to respective ones of said pair of common electrodes in the lamination direction are substantially the same (Column 3, lines 33-51).

With respect to claim 15, Takahashi discloses each of said common electrodes extends substantially over the whole area defined between said piezoelectric layers sandwiching said common electrode (Figure 3, elements 42a-42d; Column 3, lines 52-62).

With respect to claim 16, Takahashi discloses each of said common electrodes has an exposed portion, said exposed portion being exposed on a side surface of said multilayer sheet (Column 4, lines 15-21).

With respect to claim 17, Takahashi discloses each of said common electrodes is grounded through said exposed portion (Figure 7, electric circuit diagram).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 8, 9, 18, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US 5,266,964) in view of Jeong et al. (US 6,416,172 B2).

Takahashi discloses an inkjet head with the exception of a conductive pattern formed on the surface of the piezoelectric unit to electrically connect the common electrodes at their exposed surfaces and a surface electrode formed on a peripheral area on the top face to extend the conductive pattern.

Jeong discloses a common lead line (Figure 2 element 23a), to connect the common electrodes (Figure 3, element 23), and pads (Figure 2, element 54) installed on the cover to complete the electrical connection (Column 4, lines 45-61).

At the time of the invention, it would have been obvious for a person of ordinary skill in the art to use the teachings of Jeong in the inkjet head of Takahashi. The motivation for doing so would have been to electrically connect all of the common electrodes with one conductive pattern.

Claims 10 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi et al. (US 5,266,964) in view of Hanabata (US 6,478,412 B1).

Takahashi discloses an inkjet head with the exception of the piezoelectric unit having a substantially trapezoidal form.

Hanabata discloses a piezoelectric thin film element having an inverse trapezoidal section (Column 10, lines 21-32).

At the time of the invention, it would have been obvious for a person of ordinary skill in the art to use the teachings of Hanabata in the inkjet head of Takahashi. The motivation for doing so would have been to produce a piezoelectric actuator that can produce improved displacement.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Tanikawa et al. (US 6,431,691) discloses a piezoelectric actuator with laminated layers. Sawyer (US 1,803,274) discloses the shape of a piezoelectric crystal.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Geoffrey Mruk whose telephone number is (571) 272-2810. The examiner can normally be reached on 7am - 330pm.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Meier can be reached on (571) 272-2149. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2853

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

GSM
2/19/2005

GM


MANISH SHAH
Primary Examiner